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EXAMINER

WOZNIAK, JAMES S

ART UNIT	PAPER NUMBER
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2626

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/723,995

Applicant(s)

DENG ET AL.

Examiner

James S. Wozniak

Art Unit

2626

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- ☐ Notice of Informal Patent Application
- ☐ Other: _____

DETAILED ACTION

Claim Objections

1. **Claim 22** is objected to because of the following informalities:

In claim 22, line 3, “continuous” should be changed to –continuously--.

Appropriate correction is required.

Claim Rejections - 35 USC § 101

2. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. **Claims 14-22** are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim 14 is drawn to a “program” *per se* as recited in the preamble (i.e., “computer-executable instructions for performing steps comprising:”) and as such is non-statutory subject matter. See MPEP § 2106.IV.B.1.a. Data structures not claimed as embodied in computer readable media (i.e., computer readable medium storing computer-executable instructions that when *executed by a computer* cause a computer to...) are descriptive material *per se* and are not statutory because they are not capable of causing functional change in the computer. See, e.g., *Warmerdam*, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure *per se* held nonstatutory). Such claimed data structures do not define any structural and functional

interrelationships between the data structure and other claimed aspects of the invention, which permit the data structure's functionality to be realized. In contrast, a claimed tangible computer readable medium encoded with a data structure defines structural and functional interrelationships between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized, and is thus statutory. Similarly, computer programs claimed as computer listings *per se*, i.e., the descriptions or expressions of the programs are not physical "things." They are neither computer components nor statutory processes, as they are not "acts" being performed. Such claimed computer programs do not define any structural and functional interrelationships between the computer program and other claimed elements of a computer, which permit the computer program's functionality to be realized. Also, in the present case, the scope of claim 14 is not limited to the recited tangible computer readable mediums disclosed on Pages 7-8 of the specification since it includes non-tangible computer readable mediums (*communication media, etc.*), and as such is further directed to non-statutory subject matter.

The dependent claims do not remedy the 35 U.S.C. 101 issues noted with respect to claim 14, and thus, are also rejected under 35 U.S.C. 101 as being directed to non-statutory subject matter.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. **Claims 1-4, 8-19, and 22** are rejected under 35 U.S.C. 102(b) as being anticipated by Dusan (*"Statistical Estimation of Articulatory Trajectories from the Speech Signal Using Dynamical and Phonological Constraints,"* 2000).

With respect to **Claim 1**, Dusan discloses:

Defining a state equation that is linear with respect to a past vocal tract resonance vector and that predicts a current vocal tract resonance vector (*linear state equation, pp. 70-73; and pp. 99-100*);

Defining an observation equation that is linear with respect to a current vocal tract resonance vector and that predicts at least one component of an observation vector (*linearization of a vocal tract observation equation, pp. 99-100*); and

Using the state equation, the observation equation, and a sequence of observation vectors to identify a sequence of vocal tract resonance vectors, each vocal tract resonance vector comprising at least one vocal tract resonance frequency (*vocal tract formant prediction utilizing the linear state equation, the linear observation equation, and a sequence of observation vectors, pp. 101-104*).

With respect to **Claim 2**, Dusan further discloses:

Using the state equation, the observation equation, and the sequence of observation vectors to identify a sequence of vocal tract resonance vectors comprises applying the state equation, the observation equation and the sequence of observation vectors to a Kalman Filter (*Kalman filtering, pp. 101-104*).

With respect to **Claim 3**, Dusan further discloses:

Identifying a vocal tract resonance vector comprises identifying a vocal tract resonance vector from a continuous set of values (*vocal tract formant estimation for continuous speech, p. 89*).

With respect to **Claim 4**, Dusan further discloses:

Defining the observation equation comprises defining a linear approximation to a function that is non-linear with respect to the vocal tract resonance vector (*linearization of a vocal tract observation equation, pp. 99-100*).

With respect to **Claim 8**, Dusan further discloses:

Defining a linear approximation comprises selecting a linear approximation from a set of linear approximations that together form a piecewise linear approximation to the non-linear function (*forming a piecewise linear approximation of a vocal tract using codebooks, abstract and p. 82*).

With respect to **Claim 9**, Dusan further discloses:

Evaluating the non-linear function based on an estimate of a vocal tract resonance vector to produce a non-linear function value and using the non-linear function value to select parameters for the linear approximation (*using an estimated formant observation vector in a codebook look-up process, pp. 79-82*).

Claim 10 contains subject matter similar to Claims 8-9, and thus, is rejected for the same reason.

With respect to **Claim 11**, Dusan further discloses:

Using the identified vocal tract resonance vectors to redefine the observation equation; and using the redefined observation equation, the state equation, and the observation vectors to identify a new sequence of vocal tract resonance vectors (*iterative Kalman filter, pp. 101-102*).

With respect to **Claim 12**, Dusan further discloses:

The observation equation comprises using an identified vocal tract resonance vector to select parameters for at least one linear approximation to a function that is non-linear with respect to a vocal tract resonance vector (*re-linearization utilizing previous state parameters, p. 102 and pp. 99-100*).

Claim 13 contains subject matter similar to Claims 10 and 12, and thus, is rejected for the same reasons.

With respect to **Claim 14**, Dusan discloses:

Using an estimate of at least one vocal tract resonance component to select a linear approximation to a function that is non-linear with respect to the vocal tract resonance component (*forming a piecewise linear approximation of a vocal tract using codebooks, abstract and p. 82 and linearization of a vocal tract observation equation, pp. 99-100*);

Using the linear approximation to define an observation equation (*linearization of a vocal tract observation equation, pp. 99-100*); and

Using the observation equation and at least one observed vector to re-estimate the vocal tract resonance component (*vocal tract correction and iterative smoothing using a Kalman filter, pp. 101-102*).

Dusan further discloses method implementation as a program running on a computer (*p. 102*), which would inherently require some type of computer readable medium for program storage.

Claim 15 contains subject matter similar to Claim 8, and thus, is rejected for the same reasons.

Claim 16 contains subject matter similar to Claim 9, and thus, is rejected for the same reasons.

With respect to **Claim 17**, Dusan discloses the linear state equation as applied to Claim 1.

With respect to **Claim 18**, Dusan discloses the Kalman filter as applied to Claim 14.

With respect to **Claim 19**, Dusan discloses processing a sequence of different observations (*p. 104*).

Claim 22 contains subject matter similar to Claim 3, and thus, is rejected for the same reasons.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. **Claims 5-7 and 20-21** are rejected under 35 U.S.C. 103(a) as being unpatentable over Dusan in view of Takizawa et al (*U.S. Patent: 5,361,324*).

With respect to **Claims 5-7**, Dusan discloses the method for tracking a vocal tract utilizing a state equation, observation equation, and Kalman filter, as applied to Claim 1. Although Dusan discloses the use of cepstrum parameters (*p. 73*), Dusan does not explicitly recite a non-linear equation for calculating cepstrum coefficients, wherein the non-linear equation comprises the product of a sinusoidal function with an exponential function. Takizawa, however, recites such a cepstrum coefficient equation (*Col. 6, Lines 53-64*).

Dusan and Takizawa are analogous art because they are from a similar field of endeavor in vocal tract analysis. Thus, it would have been obvious to a person of ordinary skill in the art, at the time of invention, to modify the teachings of Dusan with the cepstrum coefficient calculation concept taught by Takizawa in order to provide a well-known method for easily calculating a vocal tract parameter that is stable for recognition (*Takizawa, Col. 5, Lines 32-34*).

Claims 20-21 contain subject matter similar to Claims 5-7, and thus, are rejected for the same reasons.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Mazor et al (*U.S. Patent: 4,790,016*)- discloses a method for estimating a spectral envelope using piecewise linear approximation.

Chen et al (*U.S. Patent: 5,148,488*)- discloses the use of a Kalman filter for speech signal approximation.

Heddle (*U.S. Patent: 5,946,652*)- discloses a method for piecewise linear approximation of a set of non-linear functions.

Chatterjee (*U.S. Patent: 6,567,777*)- discloses a method for approximating a speech magnitude spectrum using piecewise linear approximation.

Blomberg (*Training Production Parameters of Context-Dependent Phones for Speech Recognition, " 1994*)- discloses piecewise linear approximation of speech parameter envelopes.

Dusan et al (*"Recovering Vocal Tract Shapes from MFCC Parameters," 1998*)- discloses a method for recovering a vocal tract shape utilizing Kalman filtering.

Ramsay et al (*"Optimal Filtering and Smoothing for Speech Recognition Using a Stochastic Target Model," 1996*)- discloses a method for determining vocal tract parameters.

Ma et al (*"A Mixture Linear Model with Target-Directed Dynamics for Spontaneous Speech Recognition," 2002*)- discloses the use of a Kalman filter in vocal tract parameter estimation.

Zheng et al (*"Acoustic Segmentation Using Switching State Kalman Filter," 2003*)- discloses a method for acoustic segmentation using a Kalman filter.


9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to James S. Wozniak whose telephone number is (571) 272-7632. The examiner can normally be reached on M-Th, 7:30-5:00, F, 7:30-4, Off Alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Edouard can be reached at (571) 272-7603. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2626

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

James S. Wozniak
6/28/2007


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SUPERVISORY PATENT EXAMINER